



# The Opisthobranchs (Mollusca: Gastropoda) of the Coastal Lagoon "Ria Formosa" in Southern Portugal

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**KEY WORDS:** Mollusca, Gastropoda, Opisthobranchia, Portugal, Algarve, Ria Formosa, Coastal Lagoon, Taxonomy and Biogeography

**ABSTRACT** New data are reported on the opisthobranch molluscs of Ria Formosa (a coastal lagoon in Algarve, Southern Portugal) and Portugal, as a result of the field work that took place between 1996 and 1998 within the project "Study and contribution to the general understanding of the gastropod molluscs of Ria Formosa".

In the present paper, the authors mention a total of 25 species, of which 13 are first references for Ria Formosa; out of these, 6 are new additions to the Algarve and 4 to the Portuguese fauna. A biogeographical discussion on these new findings is added and the opisthobranch fauna present in the Ria Formosa coastal lagoon is reviewed.

**RIASSUNTO** Come risultato dei campionamenti realizzati tra gli anni 1996 e 1998 nell'ambito del progetto "Studio e contribuzione alla conoscenza generale dei molluschi gasteropodi di Ria Formosa" si riportano nuovi dati sugli opistobranchi di Ria Formosa (una laguna costiera in Algarve, Sud del Portogallo). Nel presente lavoro vengono citati 25 specie di opistobranchi, 13 dei quali costituiscono il primo rinvenimento per Ria Formosa. Di quest'ultime, 6 sono il primo rinvenimento per la regione dell'Algarve e 4 per il Portogallo. Sulla base della nuova informazione aggiunta, viene presentata una discussione biogeografica insieme alla revisione della fauna di degli opistobranchi di quest'area geografica.

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## INTRODUCTION

In Portugal the study of the opisthobranch molluscs began with PAULINO DE OLIVEIRA (1895), in whose work in which forty five species are mentioned. According to the author, thirty four of them were referred for Portugal for the first time, thirteen or fourteen were new for the Atlantic Ocean and three were new to Science. The works by AUGUSTO NOBRE (1932; 1936; 1938-40) still constitute the main malacological inventories for the Portuguese fauna. As far as the Portuguese opisthobranch fauna is concerned, Augusto Nobre also played a relevant part, adding thirty-one new species to the inventory of Paulino de Oliveira. FEZ (1974) studies the orders Ascoglossa and Nudibranchia of Portugal and Spain, but when it comes to Portugal, it is but a mere bibliographical compilation of the information already available, not adding anything new to the opisthobranchs of Portugal.

A check-list of the opisthobranchs of the Iberian Peninsula, Balears and Canary Islands, in which the Portuguese area is mentioned in a detailed way, was elaborated by CERVERA *et al.* (1988) and it indicates the authors the occurrence of ninety one species for the continental coasts of Portugal. GARCÍA-GÓMEZ *et al.* (1991), proceed to the updating of this same inventory, referring the existence of a total of one hundred and fifty seven species in the Portuguese continental coasts (Cephalaspidea: 45; Anaspidea: 6; Thecosomata: 7; Gymnosomata: 1; Sacoglossa: 7; Notaspidea: 6; Nudibranchia: 85). More recently CALADO & URGORRI (1999) and CALADO *et al.* (1999), in studies concerning the opisthobranchs from the setentrional coast of Portugal, mention the occurrence of nineteen new species, one cephalaspidean, two sacoglossans, one acochliadiacean, one notaspidean and fourteen nudibranchs.

However, many other authors also mention the occurrence of opisthobranch species in Portugal, in malacological or general zoology works, namely MCANDREW (1852), LOCARD (1897), BRAGANÇA (1902), HIDALGO (1916; 1917), PRUVOT-FOL (1954), WIRZ-MANGOLD & WYSS (1958), ALMAÇA (1960), FERREIRA (1966), RAMPAL (1968), NORDSIECK (1972), SALDANHA (1974), BOUCHET (1975), SILVESTRE *et al.* (1979), SILVESTRE & BAPTISTA (1980), CICCONE & SAVONA (1982), HOEKSEMA & JANSSEN (1984), BURNAY (1986), SANTOS *et al.* (1986), REIS *et al.* (1986), GARCÍA-GÓMEZ & CERVERA (1989), GARCÍA-GÓMEZ *et al.* (1990), CERVERA *et al.* (1991; 1992), GAMITO (1994), SPRUNG (1994), CALVÁRIO (1986; 1995), MACEDO (1996), ORTEA *et al.* (1996), VALDÉS *et al.* (1996), MACHADO & FONSECA (1997) and MACEDO *et al.* (1999).

When we compare to the coastal lagoons environments of the Portuguese coast and in particular the "Ria Formosa", no study was accomplished on their opisthobranchs, with the exception of GARCÍA-GÓMEZ *et al.* (1991). Any existing references were to be found in more general works, such as PAULINO DE OLIVEIRA (1895), HIDALGO (1917), NOBRE (1932; 1936; 1938-40), FERREIRA (1966), SILVESTRE *et al.* (1979), SILVESTRE & BAPTISTA (1980), SANTOS *et al.* (1986), REIS *et al.* (1986), GAMITO (1994), SPRUNG (1994), CALVÁRIO (1986; 1995) MACHADO & FONSECA (1997) and MACEDO *et al.* (1999).

The main purpose of the present paper is to present new data on the opisthobranch molluscs of "Ria Formosa" and Portugal, resulting from samples collected in 1996 and 1998, within the project "Study and contribution to the general understanding of the gastropod molluscs of Ria Formosa", as well as to contribute to the characterisation of the opisthobranch molluscs associated

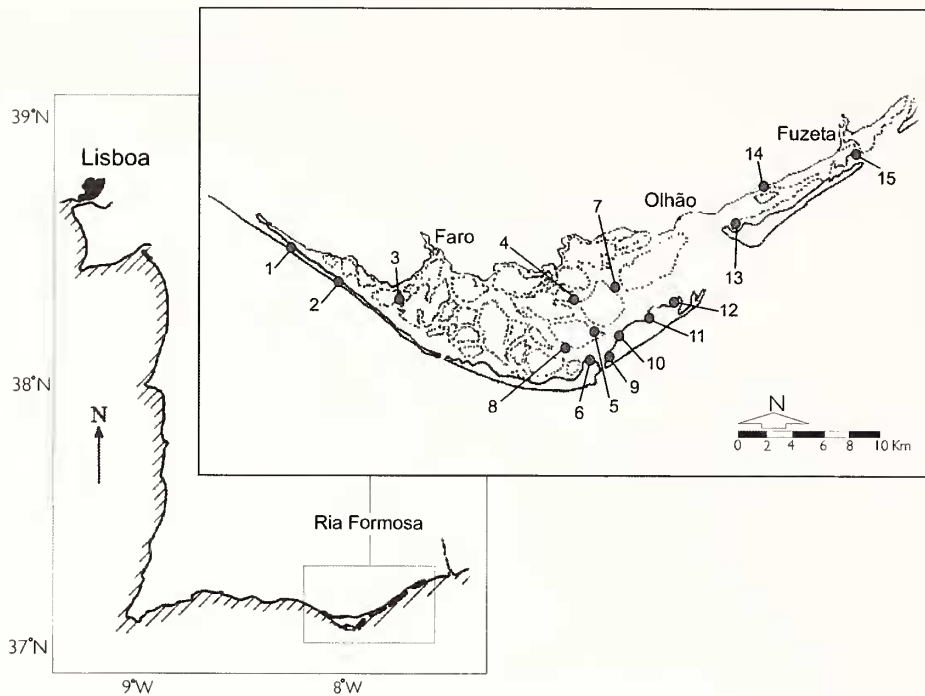


Figure 1 - Ria Formosa: Geographical position and sampling stations. E.1 - Península do Ancão (Ancão/Ilha de Faro); E.2 - Península do Ancão (Ilha de Faro, residential area between the bridge and Ancão opening); E.3 - Esteiro do Ramalhere; E.4 - Canal da Retorta (Ilhéus dos Gemidos); E.5 - Esteiro dos Cações; E.6 - Barra de Faro -Olhão (Golada); E.7 - Esteiro da Garganta; E.8 - Ponta do Barro (cabeço); E.9 - Barra de Faro-Olhão (near I.S.N.); E.10 - Hangares; E.11 - Culatra; E.12 - Lavajo de São Lourenço; E.13 - Armona; E.14 - Praia dos Cavacos; E.15 - Morteira de Baixo

to the environment coastal lagoons in Europe. We also present a bibliographical revision of the species of opisthobranch molluscs referred for "Ria Formosa".

## DESCRIPTION OF THE STUDY AREA

"Ria Formosa" is a vast lagoon system, located in the province of Algarve, South of Portugal, that extends along approximately 55 km with a total surface of 17000ha, among the Latitude  $36^{\circ} 58'$  to  $37^{\circ} 03'$  North and the Longitude  $7^{\circ} 32'$  to  $8^{\circ} 02'$  West. To the South, it is bounded by a barrier-system, formed by a series of peninsulas and islands, interrupted by seven openings that establish the communication with the sea. The distribution of different types of bottoms in this lagoon is quite irregular, presenting a medium depth of 3-4 meters. In the openings and in some channels, the depth may reach 20 meters. Fourteen percent of the surface of the lagoon is permanently submerged and eighty percent is exposed at the low tide periods during extreme tides

CALVÁRIO (1995) considers the existence of five different biota in "Ria Formosa", namely the biota of sand, the biota of muddy-sand, the biota of sandy-mud, the muddy biota and the fanerogams biota (beds predominantly of *Zostera marina* mixed with *Zostera noltii* and *Cymodocea nodosa*).

## MATERIAL AND METHODS

The sampling stations were chosen according to the substrates of the internal zone indicated by CALVÁRIO (1995). The sam-

plings were made in the intertidal zone, as well as in zones permanently submerged down to the depth of twenty meters, using SCUBA diving techniques. Samplings were made in sand, sandy-mud, muddy-sand, rocks or other hard substratum (concrete or iron structures) and substrates with vegetation (algae and marine fanerogams). Twenty-one sampling efforts were made in fifteen different places between the years of 1996 and 1998 (Fig.1).

The collecting methods ranged from manual capture upon direct observation of the specimens to brushing and suction of surfaces, using an air-suction device. The materials collected by indirect methods were sieved (sieves with decreasing meshes of 4, 2 and 0,5mm) in running sea water and placed in trays. The biological material was observed under a stereomicroscope and species were separated. The specimens were photographed and anaesthetised with magnesium chloride at 7%, dissolved in sea water and preserved in Bouin solution.

## RESULTS

In Table 1, we present the list of the species collected during our field work, with references to the sampling stations, collecting dates, number of specimens, habitat and remarks concerning our knowledge of the occurrence of the species in the study area.

The order Cephalaspidea is taken in this paper in *sensu lato*, on the basis of the conclusions of the MIKKELSEN's paper (1996).



Table 1 - Species collected during the present work

SPECIES	SAMPLING STATIONS	REFERENCES
Order CEPHALASPIDEA s.l. Fischer, 1883		
Family Retusidae Thiele, 1926		
<i>Retusa mammillata</i> (Philippi, 1880)	E.2, 17/05/96, 1 specimen, intertidal, sandy-mud	First reference for "Ria Formosa"
Family Philinidae Gray, 1850		
<i>Philine</i> cf. <i>aperta</i> (Linné, 1767)	E.8, 5/06/96, 1 specimen, sandy-mud	See Annex 1
Family Bullidae Lamarck, 1809		
<i>Bulla striata</i> Bruguière, 1972	E.1, 19/02/96, few specimens, intertidal, on vegetation; E.2, 17/05/96, few specimens, intertidal, on vegetation; E.11, 18/04/96, few specimens, intertidal, muddy-sand; E.13, 31/05/96, few specimens, intertidal, on vegetation; E.14, 19/03/96, intertidal, on vegetation; E.15, 19/04/96, few specimens, intertidal, on vegetation.	See Annex 1
Family Haminoeidae Pilsbry, 1895		
<i>Haminoea hydatis</i> (Linné, 1758)	E.1, 19/02/96, few specimens, intertidal, on vegetation; E.3, 17/04/96, 16/05/96, few specimens, intertidal, on vegetation	See Annex 1
Order ANASPIDEA Fischer, 1883		
Family Aplysiidae Lamarck, 1809		
<i>Aplysia depilans</i> Gmelin, 1791	E.2, 26/02/96, 1 specimen, 2 meters, muddy bottom	See Annex 1
<i>Aplysia fasciata</i> Poiret, 1789	E.1, 19/02/96, few specimens, on vegetation; E.11, 18/04/96, few specimens, intertidal, on vegetation; E.2, 17/05/96, few specimens, intertidal, on vegetation; E.4, 25/07/96, few specimens, 4-5 depth on vegetation; E.13, 31/05/96, few specimens, intertidal, on vegetation; E.15, 19/04/96, few specimens, intertidal, on vegetation	See Annex 1
Order ASCOGLOSSA Bergh, 1876		
Family Placobranchidae Rang, 1829		
<i>Elysia viridis</i> (Montagu, 1804)	E.14, 6/01/98, 1 specimen, intertidal, in a tidal pool on <i>Ulva</i> sp.	See Annex 1
Order NOTASPIDEA Fischer, 1883		
Family Pleurobranchidae Férussac, 1822		
<i>Berthellina edwardsi</i> (Vayssiere, 1896)	E.1, 19/02/96, 1 specimen intertidal, muddy-sand with vegetation; E.2, 26/02/96, 1 specimen, 2 meters depth; E.12, 16/06/96, 1 specimen, 6 meters depth.	First reference for "Ria Formosa" and Algarve
Order NUDIBRANCHIA Blainville, 1814		
Family Polycerataidae Alder & Hancock, 1845		
<i>Tambja marbellensis</i> Schick & Cervera, 1998	E.9, 24/01/96, 1 specimen, 10-20 meters depth	First reference for "Ria Formosa", Algarve and Portugal
<i>Limacia clavigera</i> (O. F. Müller, 1776)	E.10, 1/07/96, 2 specimens, 4 meters depth	First reference for "Ria Formosa"
Family Chromodorididae Bergh, 1891		
<i>Hypselodoris villafranca</i> (Risso, 1818)	E.10, 1/07/96, 1 specimen, 2-3 meters depth, on vegetation; E.10, 9/05/97, 1 specimen, 4-5 meters depth on rocky bottom	See Annex 1
<i>Hypselodoris cantabrica</i> Bouchet & Ortea, 1980	E.9, 24/02/96, 3 specimens, 12-15 meters depth, on rocks; E.10, 24/06/96, 11 specimens, 10-20 meters depth on rocks.	First reference for "Ria Formosa"
<i>Hypselodoris midatlantica</i> Gosliner, 1990	E.9, 25/06/96, 1 specimen, 19 meters depth; E.10, 9/05/97, 1 specimen, 4-5 meters on rocky bottom	First reference for "Ria Formosa" and Algarve
<i>Chromodoris purpurea</i> (Laurillard, 1831)	E.6, 9/05/97, 1 specimen, 4-5 meters depth, on rocks; E.9, 24/02/96, 1 specimen, 15 meters depth, on rocks; E.10, 1/07/96, 1 specimen, 2-3 meters depth; E.12, 16/06/96, 1 specimen, 5-6 meters depth	See Annex 1
<i>Chromodoris krohni</i> (Vérany, 1846)	E.7, 15/06/96, 1 specimen with 18mm, 4-5 meters depth on muddy bottom with tunicates and <i>Zostera</i> ; E.9, 24/06/96, 1 specimen, 16mm long	See Annex 1
<i>Chromodoris luteopunctata</i> (Gäntes, 1962)	E.9, 24/06/96, 1 specimen, 10-20 meters depth, on rocks	First reference for "Ria Formosa", Algarve and Portugal
Family Discodorididae Bergh, 1891		
<i>Discodoris rosi</i> Ortea, 1979	E.6, 9/05/97, 1 specimen, 4-5 meters depth, on rocks	First reference for "Ria Formosa"
Family Kentroderididae Bergh, 1892		
<i>Jorunna onubensis</i> Cervera, García-Gómez & García, 1986	E.6, 9/05/97, 2 specimens, 4-5 meters depth, on rocks	First reference for "Ria Formosa", Algarve and Portugal
Family Dendrodorididae O'Donoghue, 1924		
<i>Dendrodoris grandiflora</i> (Rapp, 1827)	E.6, 9/05/97, 2 specimens, 4 meters depth, on rocks; E.10, 9/05/97, 1 specimen, 4 meters depth, on rocks	See Annex 1
<i>Doriopsilla areolata</i> Bergh, 1880	E.6, 9/05/97, 2 specimens, 4-5 meters depth, on rocks; E.9, 24/06/96, 1 specimen, 10-20 meters depth, on rocks; E.12, 16/06/96, 1 specimen, 5-6 meters depth	First reference for "Ria Formosa"
Family Flabellinidae Bergh, 1889		
<i>Flabellina pedata</i> (Montagu, 1815)	E.6, 9/05/97, 1 specimen, 4-5 meters depth, on rocks	First reference for "Ria Formosa"
Family Facelinidae Bergh, 1889		
<i>Dondice banyulensis</i> Portman & Sandmeier, 1960	E.9, 24/02/96, 1 specimen, 15 meters depth, on rocks; E.7, 15/06/96, 1 specimen, 4-5 meters depth, on muddy-sand with tunicates and <i>Zostera</i>	First reference for "Ria Formosa"
Family Aeolidiidae D'Orbigny, 1834		
<i>Spurilla neapolitana</i> (Delle Chiaje, 1823)	E.9, 24/06/96, 7 specimens, 10-20 meters, on rocks	See Annex 1
<i>Spurilla</i> cf. <i>vayssierei</i> García-Gómez & Cervera, 1985	E.9, 24/06/96, 1 specimen, 19 meters depth, on rocks	First reference for "Ria Formosa", Algarve and Portugal
Family Embletoniidae Schemekel, 1970		
<i>Embletonia pulchra</i> Alder & Hancock, 1851	E.9, 24/06/96, 1 specimen, 2mm long, 10-20 meters depth	See Annex 1



Twenty five species were collected: (CEPHALASPIDEA: 4, ANASPIDEA: 2, SACOGLOSSA: 1, NOTASPIDEA: 1, NUDIBRANCHIA: 17). Of these species, 13 are recorded in "Ria Formosa" for the first time, 6 are new to the Algarve and 4 of them being equally recorded for the first time for Portugal.

In the Annex 1, we show the opisthobranch species explicitly referred in the literature as occurring in "Ria Formosa". The references that PAULINO DE OLIVEIRA (1895) and NOBRE (1932; 1936; 1938-40) listed for the Cape of Santa Maria are not included in this work because that this Cape must be considered to stand outside "Ria Formosa" since CALVÁRIO (1995) considers the Southern limit of "Ria Formosa", to be the entrances of the openings.

## DISCUSSION

Thirteen of the twenty-five species mentioned in the present work are recorded for the first time for "Ria Formosa" (see Table 1), and 4 of them constitute new findings to Portugal, namely *Tambja marbellensis*, *Chromodoris luteopunctata*, *Jorunna onubensis* and *Spurilla* cf. *vayssierei*.

Our specimens of *Spurilla* are in agreement with those described by TRINCHESE (1878) and that GARCÍA & CERVERA (1985) named *Spurilla vayssierei*. However, according to CERVERA (pers. com.) the status of the species of the genus *Spurilla* Bergh, 1864 in the Atlantic Ocean, would need a critical review. For this reason, we use the name *S. vayssierei* with some restrictions.

In spite of the synonymization done by ORTEA *et al.* (1996) in the revision of blue Chromodorididae from the Atlantic, of *Hypselodoris tricolor* as *Hypselodoris midatlantica*, we decided in this work to keep the name *H. midatlantica* Gosliner, 1990. The authors proceed to this synonymization without any explanations that supported their views. Our point of view is equally shared by GOSLINER (pers. com.) and by BERTSCH (1997) who refers to the fact of the decision having been made without any explanation or discussion.

According to CERVERA, GOSLINER & GARCÍA-GÓMEZ (in prep.) the valid name for the "orange species" belonging to the genus *Berthellina* that occurs in the archipelagos of Madeira and Azores, in the Atlantic coast of Europe and in the Mediterranean is *B. edwardsi*, described by VAYSSIÈRE (1896), from one specimen collected in the Azores. The names *B. citrina* (Rüppell & Leukart, 1828) or *B. engeli* Gardiner, 1936, used to now to designate the North-Atlantic and the Mediterranean specimens, according to these authors probably, correspond to different species.

From a biogeographical point of view, and according to the regions defined by EKMAN (1967), ABBOT (1968), BRIGGS (1974), FREDJ (1974) and RODRIGUEZ (1982), five of the thirteen new references for "Ria Formosa" here mentioned have a geographical range limited to the Lusitanian and Mediterranean regions (*Tambja marbellensis*, *Discodoris rosi*, *Jorunna onubensis*, *Dondice banyulensis* and *Spurilla* cf. *vayssierei*). On the other hand, six species extend their range equally to the Mauritanian region (*Retusa mammillata*, *Berthellina edwardsi*, *Hypselodoris cantabrica*, *Hypselodoris midatlantica*, *Chromodoris luteopunctata* and *Doriopsisilla areolata areolata*) and one to the East-boreal region (*Flabellina pedata*). The specie *Limacia clavigera*, have a wider distribution,

occurring in the Atlantic Ocean from the East-boreal region to South Africa.

In a comparative study of the malacological fauna of some coastal lagoons of the Mediterranean, OLMO & ROS (1984), refer that the number of species is directly related with the extension of the lagoon. The great extension of "Ria Formosa" and the occurrence of different biota, due to the existence of marine, mixed and lagoon environments (CALVÁRIO, 1995), cause the occurrence of a high number of species.

The total number of opisthobranch species recorded for "Ria Formosa" (70 species), when compared with the number of opisthobranch species mentioned for all the coastal lagoons along the Mediterranean coast, that according to CATTANEO-VIETTI & CHEMELLO (1991) is of approximately 60 species, it may be considered that the opisthobranch fauna in "Ria Formosa" presents a high diversity.

According to the results obtained by CATTANEO-VIETTI & CHEMELLO (1991), 25 of the species recorded in "Ria Formosa" are also present in the Mediterranean coastal lagoons and 13 of them are typically euryhaline such as *Retusa mammillata*, *Retusa truncatula*, *Philine aperta*, *Bulla striata*, *Haminoea hydatis*, *Akera bullata*, *Polycera quadrilineata*, *Hypselodoris villafranca*, *Flabellina pedata*, *Favorinus branchialis*, *Aeolidiella glauca*, *Aeolidiella sanguinea* and *Embletonia pulchra*.

This abundance of species will certainly be related to two main aspects. On one hand, the diversity of existent biota, the occurrence of different types of sediments, some of them covered with beds of *Zostera* spp. and *Spartina* spp., and also the presence of hard substrates, many of them artificial (such as wharfs), where it is possible to find communities of algae, sponges, hydroids, actinaria, etc. that are good places for the occurrence of the opisthobranchs. On the other hand, the significant renewal of water in each tide cycle, approximately two thirds of the total volume, makes "Ria Formosa" a lagoon with predominantly marine characteristics (CALVÁRIO, 1995), which allows the existence of species with less tolerance for the typical variations of physical-chemical parameters of this kind of environments.

The opisthobranch mollusc of the Portuguese coastal lagoons are not well-known. In spite of the seventy referred species in "Ria Formosa", we believe that probably appear many others when the sampling efforts and strategies are increased. In our opinion, the low number of Cephalaspidea, Sacoglossa and Notaspidea species mentioned for "Ria Formosa" are indicative of such situation. The ecological particularities that the lagoon faunas present, associated to the high productivity that characterises these environments, makes the study of the opisthobranch molluscs of "Ria Formosa" and its comparison with the marine fauna of the adjacent coast an extremely interesting subject, that can contribute to a better knowledge of the ecology and physiology of the species and of the mechanisms of their geographical dispersion.

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## ANNEX 1

### Explicit bibliographical references to the presence of opisthobranch molluscs in the Ria Formosa

Order CEPHALASPIDEA s.l. Fischer, 1883

Family Ringiculidae Meeck, 1862: *Ringicula auriculata* (Ménard, 1811), NOBRE (1938-40: 101), Culatra and Tavira; *Ringicula buccinea* (Brocchii, 1814), HIDALGO (1917:544), Faro.

Family Hydatinidae Pilsbry, 1893: *Hydatina physis* (Gmelin, 1794), MACEDO *et al.* (1999: 253), Ria de Faro.

Family Retusidae Thiele, 1926: *Retusa truncatula* (Bruguière, 1792), NOBRE (1938-40:85), as *Tornatina truncatula*, Culatra. MACEDO *et al.* (1999: 254), Culatra; *Retusa* cf. *truncatella* (Locard, 1883), MACHADO & FONSECA (1997: 914), Olhão.

Family Acteonidae D'Orbigny, 1835: *Acteon tornatillis* (Linné, 1758), NOBRE (1938-40: 81), dredged in "Ria Formosa".

Family Scaphandridae G. O. Sars, 1878: *Scaphander lignarius* (Linné, 1758), NOBRE (1938-40:90), dredged in "Ria Formosa"; *Roxania utriculus?* (Brocchi, 1814), MACHADO & FONSECA (1997: 914), Olhão.

Family Philinidae Gray, 1850: *Philine aperta* (Linné, 1758), HIDALGO (1917:550), Faro. NOBRE (1938-40: 105), Culatra, Olhão and Faro; CALVÁRIO (1986: 159); MACHADO & FONSECA (1997: 914), Olhão; *Philine* cf. *catena* (Montagu, 1803), MACHADO & FONSECA (1997: 914), Olhão; *Philine* cf. *punctatata* (J. Adams, 1880), MACHADO & FONSECA (1997: 914), Olhão.

Family Gastropteridae Swainson, 1840: *Gastropteron meckeli* Kose, 1813, MACEDO *et al.* (1999: 364), Culatra, Olhão and Faro.

Family Runcinidae H. and A. Adams, 1854: *Runcina* sp., MACHADO & FONSECA (1997: 914), Olhão.

Family Bullidae Lamarck, 1801: *Bulla striata* Bruguière, 1792, PAULINO DE OLIVEIRA (1895:587), Faro. HIDALGO (1917:171), Faro and Tavira. NOBRE (1938-40:94), refers this specie as common to Faro and Tavira. FERREIRA (1966: 140) as *Bullaria striata*, Cais Novo. SILVESTRE *et al.* (1979: 15), "Ria Formosa". SILVESTRE & BAPTISTA (1980: 40) refer this specie in "Ria Formosa" as a common one. CALVÁRIO (1986: 161; 1995: 139). MACEDO *et al.* (1999: 255), Ria Formosa.

Family Haminoeidae Pilsbry, 1895: *Haminoea bydati* (Linné, 1758), PAULINO DE OLIVEIRA (1895:587), Faro as *Bulla bydati*. NOBRE (1938-40: 98), refers the species in Faro as common. SILVESTRE *et al.* (1979: 15), "Ria Formosa". SILVESTRE & BAPTISTA (1980: 40), refers the specie as common in "Ria Formosa". FERREIRA (1966: 141), Ancão and Culatra. SANTOS *et al.* (1986: 145), Tavira Chanel. REIS *et al.* (1986: 531). GAMITO (1994: 220), Olhão. SPRUNG (1994: 554), Faro. CALVÁRIO (1986: 160); *Haminoea navicula* (Da Costa, 1778), MACHADO & FONSECA (1997: 914), probably a mistake for *H. bydati*.

Order ANASPIDEA Fisher, 1883

Family Akeridae Müller, 1776: *Akera bullata* Müller, 1776, PAULINO DE OLIVEIRA (1895:587), Faro. HIDALGO (1917:119), Faro. NOBRE (1938-40: 100), Culatra and Olhão as *Acera bullata*. MACHADO & FONSECA (1997: 913), Olhão.

Family Aplysiidae Lamarck, 1809: *Aplysia depilans* Gmelin, 1791, HIDALGO (1917:138), as *Aplysia leporina*, Faro and Olhão.

NOBRE (1938-40: 106), Faro and Olhão. SILVESTRE *et al.* (1979: 15) "Ria Formosa". SILVESTRE & BAPTISTA (1980: 40) "Ria Formosa"; *Aplysia fasciata* Poiret, 1789, PAULINO DE OLIVEIRA (1895: 589), Faro as *Aplysia limacina*. NOBRE (1938-40: 107), Olhão and Faro. SILVESTRE *et al.* (1979: 15), "Ria Formosa". SILVESTRE & BAPTISTA (1980: 40), refer this species as being common in the "Ria Formosa"; *Aplysia punctata* Cuvier, 1803, NOBRE (1938-40), "Ria Formosa".

Family Dolabriferidae Pilsbry, 1895: *Phyllaplysia depressa* (Cantaine, 1835), PAULINO DE OLIVEIRA (1895:589), Faro as *Phyllaplysia paulini*. NOBRE (1938-40: 109), as *Phyllaplysia paulinoi*, "Ria Formosa". SILVESTRE *et al.* (1979: 15), "Ria Formosa" as *Phyllaplysia paulinoi*.

Order SACOGLOSSA Ihering, 1876

Family Oxinoidae H. & A. Adams, 1854: *Oxynoe olivacea* Rafinesque, 1819, MACEDO *et al.* (1999: 258), Ria de Faro.

Family Placobranchidae Rang, 1829: *Elysia viridis* (Montagu, 1804), PAULINO DE OLIVEIRA (1895:585), Faro. NOBRE (1938-40: 77), Faro and Olhão. MACEDO *et al.* (1999: 366), Faro and Olhão.

Family Hermaeidae H. Adams and A. Adams, 1854: *Hermaea* cf. *bifida* (Montagu, 1815), MACHADO & FONSECA (1997: 914), Olhão.

Family Limapontiidae Gray, 1847: *Stiliger* sp.?, MACHADO & FONSECA (1997: 914), Olhão.

Order NUDIBRANCHIA Blainville, 1814

Family Goniodorididae H. & A. Adams, 1854: *Trapania tartanella* (Ihering, 1885), GARCÍA-GÓMEZ *et al.* (1991: 129), Olhão intertidal zone.

Family Triophidae Odhner, 1941: *Crimora papillata* Alder & Hancock, 1862, GARCÍA-GÓMEZ *et al.* (1991:129), Olhão.

Family Aegiretidae Fisher, 1883: *Aegires punctilucens* (D'Orbigny, 1837), GARCÍA-GÓMEZ *et al.* (1991:129), Olhão.

Family Polycerataidae Alder & Hancock, 1845: *Polycera quadrilineata* (O. F. Müller, 1776), GARCÍA-GÓMEZ *et al.* (1991:129), Olhão intertidal zone.

Family Chromodorididae Bergh, 1891: *Hypselodoris villafranca* (Risso, 1818), NOBRE (1938-40: 55), Olhão as *Chromodoris villafranca*. GARCÍA-GÓMEZ *et al.* (1991:129), Olhão, intertidal zone. MACEDO *et al.* (1999: 369), Olhão; *Hypselodoris bilineata* (Pruvot-Fol, 1953), GARCÍA-GÓMEZ *et al.* (1991:129), Olhão; *Chromodoris purpurea* (Laurillard, 1831), GARCÍA-GÓMEZ *et al.* (1991:129), Olhão; *Chromodoris krobni* (Vérany, 1846), GARCÍA-GÓMEZ *et al.* (1991:129), Olhão.

Family Dorididae Rafinesque, 1815: *Doris verrucosa* Linné, 1758, NOBRE (1938-40: 52), near Culatra as *Staurodoris verrucosa*. GARCÍA-GÓMEZ *et al.* (1991:130), Olhão, intertidal zone; *Doris ocelligera* (Bergh, 1881), GARCÍA-GÓMEZ *et al.* (1991:130), Olhão, intertidal zone.

Family Archidorididae Bergh, 1892: *Archidoris pseudoargus* Bergh, 1879, NOBRE (1938-40: 50), Olhão as *Archidoris tuberculata*.

Family Discodorididae Bergh, 1891: *Geitodoris planata* (Alder & Hancock, 1846), NOBRE (1938-40:53), collected by dredge in Olhão. FERREIRA (1966: 142), as *Argus planata*, Olhão and Faro.



- GARCÍA-GÓMEZ *et al.* (1991:130), Olhão, intertidal zone; MACEDO *et al.* (1999: 369), Olhão.
- Family Kentrodorididae Bergh, 1892: *Jorunna tomentosa* (Cuvier, 1804), PAULINO DE OLIVEIRA (1895: 579) and NOBRE (1938-40: 51) as *Jorunna johnstoni*; MACEDO *et al.* (1999: 370) as *Jorunna johnstoni*, Olhão e Faro.
- Family Platydorididae Bergh, 1891: *Platydoris argo* (Linné, 1877), NOBRE (1938-40: 53) dredged at Faro and Culatra.
- Family Dendrodorididae O'Donoghue, 1924: *Dendrodoris grandiflora* (Rapp, 1827), GARCÍA-GÓMEZ *et al.* (1991:130), Olhão, intertidal zone.
- Family Tritoniidae Lamarck, 1809: *Tritonia manicata* Deshayes, 1853, GARCÍA-GÓMEZ *et al.* (1991:130), collected at Olhão; *Tritonia nilsodhneri* Marcus, 1983, GARCÍA-GÓMEZ *et al.* (1991:130), collected at Olhão.
- Family Dotoidae Gray, 1853: *Doto rosea* Trinchese, 1881, GARCÍA-GÓMEZ *et al.* (1991:130), collected at Olhão.
- Family Arminidae Iredale & O'Donoghue, 1923: *Armina loveni* (Bergh, 1860), FERREIRA (1966: 143), Ilha de Faro - "Ria Formosa" as *Armina lineata*; *Armina neapolitana* (Delle Chiaje, 1824), NOBRE (1938-40:61), "Ria Formosa" as *Pleurophyllidia undulata*.
- Family Facelinidae Bergh, 1889: *Favorinus branchialis* (Rathke, 1806), GARCÍA-GÓMEZ *et al.* (1991:131), collected at Olhão; *Facelina coronata* (Forbes & Goodsir, 1839), GARCÍA-GÓMEZ *et al.* (1991:131), collected at Olhão; *Dicata odhneri* Schmekel, 1967, GARCÍA-GÓMEZ *et al.* (1991:131), collected at Olhão; *Pruvotfolia pselliotes* (Labbé, 1923), GARCÍA-GÓMEZ *et al.* (1991:131), collected at Olhão.
- Family Aeolidiidae D'Orbigny, 1834: *Spurilla neapolitana* (Delle Chiaje, 1823), GARCÍA-GÓMEZ *et al.* (1991:131), collected at Olhão; *Berghia verrucicornis* (A. Costa, 1864), GARCÍA-GÓMEZ *et al.* (1991:131), collected at Olhão, intertidal zone; *Aeolidiella glauca* (Alder & Hancock, 1845), GARCÍA-GÓMEZ *et al.* (1991:131), collected at Olhão, intertidal zone; *Aeolidiella sanguinea* (Norman, 1877), GARCÍA-GÓMEZ *et al.* (1991:131), collected at Olhão, intertidal zone.
- Family Calmidae Iredale & O'Donoghue, 1923: *Calma glaucoides* (Alder & Hancock, 1854), GARCÍA-GÓMEZ *et al.* (1991:131), collected at Olhão.
- Family Tergipedidae Thiele, 1931: *Tergipes tergipes* (Forskål, 1775), GARCÍA-GÓMEZ *et al.* (1991:131), collected at Olhão; *Cuthona caerulea* (Montagu, 1804), GARCÍA-GÓMEZ *et al.* (1991:131), collected at Olhão; *Cuthona foliata* (Forbes & Goodsir, 1838), GARCÍA-GÓMEZ *et al.* (1991:131), collected at Olhão; *Cuthona genovae* (O'Donoghue, 1929), GARCÍA-GÓMEZ *et al.* (1991:131), collected at Olhão.
- Family Embletoniidae Pruvot-Fol, 1954: *Embletonia pulchra* Alder & Hancock, 1851, GARCÍA-GÓMEZ *et al.* (1991:131), collected at Olhão.